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INTERMODAL FREIGHT TERMINALS: AN ANALYSIS OF THE TERMINAL MARKET

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Intermodality has become a major goal in modern transport policy. The improvement of combined transport within the European Union includes the refinement of freight terminal services. A freight terminal is a nodal place where goods are transhipped between any two or more transport modes. In this paper we describe and analyse the freight terminal market with the help of Porter's model of five competitive forces. The central question is: who are the stakeholders in the terminal market? We will particularly address the critical decision factors faced by terminal operators in terms of strategic importance, location and network configuration of freight terminals by employing Porter's competitive focus. First, the industry competitors in the freight terminal market will be analysed. Second, the buyers of the freight terminal services will be described, followed by the suppliers of the terminal infrastructure. Other competitive forces are the potential entrants into the terminal market and the substitutes for the use of freight terminals. An additional competitive force is added to our conceptual model in the form of the terminal environment. After the outline of this analytical framework of the freight terminal market, it is possible to identify where the economic power is located in the terminal market and how the positions of the different players in the market can be enhanced. The analysis will further address (de)regulation competences for different governmental levels involved in terminal activities.

Keywords: Freight transport; Intermodality; Terminals; Markets; Competitive forces

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1 INTERMODAL FREIGHT TERMINALS: INTRODUCTION

A terminal is a place where goods are transferred between any two or more freight transport modes. In this interface unit loads are collected, exchanged, stored and/or distributed. The handling operations at the freight terminal may include the same transport mode or two different transport modes. Generally, the total real transportation costs increase markedly at the terminal point. This point of view is strengthened by Bowersox *et al.* (1986). They view handling as one of the most costly aspects of logistic channel performance, and thus the objective is to reduce handling operations in the logistic chain to an absolute minimum.

The logistic chain is here defined as the integrated perception of production, transport and the market place (Coyle *et al.*, 1994). It is noteworthy that at present in Europe much effort is aimed at increasing the bundling of freight flows and the use of new generation terminals which will mean an *increase* in the use of the handling operations at freight terminals. An increase in handling can only be justified by a considerable increase in the performance of the current terminals, a decrease in costs, or a combination of the two foregoing developments. The aim of this paper is to elaborate upon the potentiality of new generation freight terminals and the bundling of freight flows. The central question in this exploratory section is: *Where is the economic power located in the terminal market?* By economic power we mean: the potential to generate benefits, in terms of profits from invested capital in the long-run. Porter's model of the five competitive forces (Porter, 1980) is a very useful framework when describing the freight terminal market and in providing an answer to the above question. This model makes possible the analysis of the current and future strengths of competitive forces within a certain market. If other competitive forces are strong this means that the profit potential for industry competitors is lower. Furthermore, the profit potential is not the same in each sector. In every market, pressure is placed on each company as a result of competition. Competition is more multi-faceted than just winning strategies of the industry competitors in the current terminal market. Substitutes, buyers, suppliers and potential entrants also influence the current freight terminal market. One additional force is added to our analysis in the form of the terminal

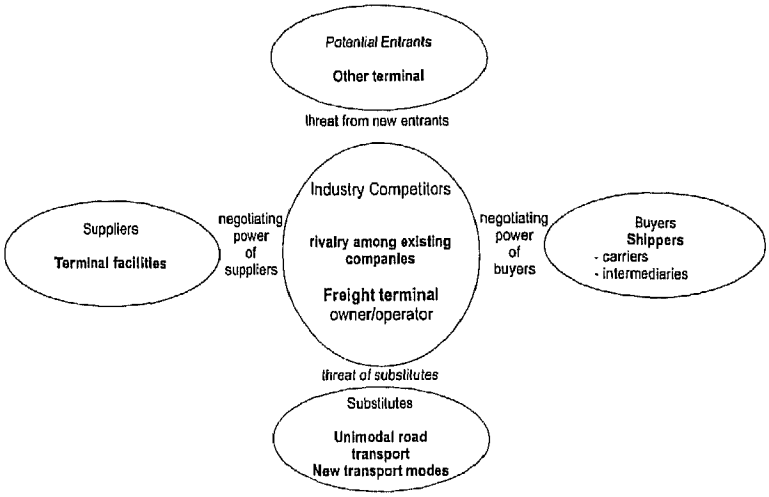

FIGURE 1 Porter's model of five competitive forces applied to the intermodal terminal market.

environment. The five competitive forces in Porter's model are depicted in Fig. 1.

2 INDUSTRY COMPETITORS

2.1 Introduction

The first competitive force in Porter's model in Fig. 1 is the "Industry competitor" in the terminal market. The freight terminal market is defined as all freight terminals throughout the European Union where activities are deployed that facilitate combined transport related operations, especially the (direct) transhipment of goods. There is competition among industry competitors because actors see chances or feel pressure to improve their positions. The competition intensity among the industry competitors depends on a number of factors:

(1) Many or equal number of competitors results in instability
(2) Slow industry growth results in competition for market share
(3) High investment costs forces the industry competitors to concentrate on capacity
(4) Lack of switching costs is followed by service and price competition.

The first competitive force is extremely complicated because there are a great number of actors involved and many terminals throughout Europe. The terminals compete with each other to provide the best services at their terminals for the lowest possible price. Ultimately this will hopefully result in the attraction of more freight flows and a better serviced customer.

In the terminal market we have two important groups of industry competitors. The first group consists of terminal *owners* who are *not* providing the terminal services by themselves. The only service they provide is the facilitation of the central terminal services. This can manifest as the provision of a paved terminal area, office space, cranes, or warehouses. Basically, there are three forms of terminal ownership: privately owned freight terminals, publicly owned terminals, or a public/private partnership. Especially the third form of ownership can further complicate daily operations because the actors often have conflicting interests. In general, public parties provide public goods while private parties are mainly interested in profits. In our analysis only the private terminal owner will, for the time being, be taken into account. The private terminal owner is especially interested in the investments related to the infrastructure of the terminal and to the operating costs of facilitating the terminal services. Their main goal is to facilitate the central terminal services, or to put it simply: selling (renting/leasing) equipped square meters. Customers of a terminal owner can be found among carriers of goods and intermediate companies.

In and around a terminal we often observe the emergence and growth of some logistical cluster. Interestingly, not all companies involved necessarily use the services offered by the terminal operator. Transport companies, for example, may also find it useful merely to be located near or even on the terminal area.

In order to provide the facilitating services, the terminal owner can use their marketing mix: price, promotion, place, people and product. The product of the terminal owner can be divided into pavement, office, and warehouse square meters. The aim is to provide the customer with the best combination of square meters. The price for the square meters depends on the negotiation skills of both parties, on the total square meter volume and combination, the terminal location, and on the market power of both parties. The price is also influenced by the quality of the delivered square meters (for example, a refrigerated warehouse

will be priced differently than a bulk warehouse). Promotion of terminal services especially relies on personal contacts, but other useful promotion channels exist on the Internet and with advertising. People are an important element of the marketing mix. In the negotiation process the skills of sales personnel for representing the terminal and selling services from the terminal service assortment for a good price are necessary. The terminal owner will try to ensure that the terminal area is located on an interesting place in the logistical network. Rail, road and water connections are important place-related conditions, as are the origin and destination characteristics of the freight.

The second group of industry competitors consists of the terminal operator who provides the terminal service assortment. The terminal operator may or may not be the owner. The terminal operation can be accomplished by a national railway company, seaport company, private company, consortium, independent regional operator, multimodal shipping companies/forwarders, road haulage industry, and/or even cities. In this paper the terminal operator is in principle a private company. The terminal operator is particularly interested in the costs of the services provided to customers. The main goal is to provide terminal services that are requested by customers. In order to provide the terminal services, the marketing mix can be used: product, promotion, price, people and place. The product of the terminal operator is the terminal service assortment. This assortment differs from terminal to terminal and can be very broad. The three central service groups that can be provided by the terminal operator are defined as follows: central terminal services, terminal related services, and diverted terminal services. These three groups can be sub-divided into twelve classes of sub-services:

A. Central terminal services:
(1) Loading and unloading
(2) Direct transhipment without storage
(3) Storage
(4) Cargo groupage ((un)bundling).

B. Terminal related services:
(1) Freight handling
(2) Collection and/or distribution of freight
(3) Physical transport of freight

(4) Freight monitoring
(5) Intelligent (IT-intensive) transport.

C. Diverted terminal services:
(1) Manufacturing
(2) Renting, leasing or selling services
(3) Other services.

The aim of the terminal operator is to provide the customer with terminal services for the best possible price. The best possible price is not necessarily the lowest price because the delivered terminal service(s) are in general the best combination of time, place and costs. Promotion of the terminal products relies especially on personal contacts of salespeople. The people on the "terminal work floor" should be flexible, dedicated to their tasks, and ideally be able to provide all terminal services. The terminal operator will furthermore guarantee that the terminal service assortment fits into the logistical network of clients.

Entry and exit barriers also form part of the industry competitive force. Entry barriers will be dealt with later. Exit barriers are factors that keep an industry competitor in the market, even if the return on investment is too low or even negative. This is especially true of the terminal market: high investments in cranes and other terminal facilities (or long-term leasing contracts) impose a major exit barrier for the terminal operator who is already active in the market. Since exit barriers are relatively high and the entry barriers relatively low this automatically means that the profits in the freight terminal market can only be low and risky. A further complication arises because all the terminal operators attempt to fill their capacity. This is caused by the terminal cost structure: high fixed costs and low variable costs, and this means more pressure on profits in the terminal market.

The positioning of the freight terminal in the market is important and this raises the strategic question: what is the final goal of the terminal? The terminal operator provides a certain service assortment and has one or more of the following mission statements when doing business:

- lowest possible costs
- best service assortment
- best price/quality ratio
- best service quality

- highest market share
- highest return on investment.

Each high-performing company obviously has a set of pre-specified business goals. Freight terminals will make statements such as: "we aim to provide terminal services at the lowest possible cost," or "we provide the best terminal service quality." The strategic meaning of these statement(s) for the terminal operator is that a certain pre-defined level of performance through the specification of a clear business goal has to be guaranteed. The value of such a mission statement for customers is that they know exactly what to expect from the company.

2.2 Characteristics of the Industry Competitors

A better understanding of the terminal market proceeds with the classification and the characteristics of freight terminals in the European Union in general. A thorough investigation of the literature (EU, 1997; Konings, 1996; Kreutzberger, 1997; NEA, 1991; 1992, Transport Research APAS Strategic Transport, 1996a,b) leads to Table I with the terminal characteristics. This table shows that many characteristic measurements are used to describe the types of terminals currently in use. The challenge now is to distinguish among a number of freight terminals. It is important to identify the different classes of terminal because not all of them serve the same market with the same service assortment. Distinguishing features are therefore necessary in this process. *First*, the maximum volume that a terminal can handle in a year is a specific characteristic. The volume of a terminal can be expressed in tonnes per year, twentyfeet equivalent unit (TEU) per year, containers per year, handlings per year, and load units (LU) per year, etc. These features are all helpful in making a difference among terminals; they are not necessarily performance related. Ultimately it is possible to say something about the maximum capacity of a terminal and thus also about the final resulting costs per handling. A *second* set of features is encompassed by the available transport modes at the freight terminal. Distinguishing characteristics among transport modes at a terminal are, for example, the number of railway tracks, the number of road lanes, the length of the trains that can be handled, the quay length and the length of the crane track(s). These elements are also not performance related; they only give an indication of the possible capacity of the terminal.

TABLE I Terminal characteristics

Volume	*Transport modes*	*Terminal operating time*	*Terminal*	*LU/TU*	*Cranes*
Million tonnes/ year containers/year	Number of rail tracks	Number of working days/year	Hectares	Rail wagon, truck, semi-trailer	Number of rail-road cranes
Moves/year TEU/ year LU/year	Metres train length weight of train	Hours/days days/year days/week	Square meters	Container unit	Number of road cranes number of gantry cranes
Trains/night trains/ day trains/ hour trains/24 h	Number of road lanes	Road gate opening hours/day or week	Transhipment area, storage area, road area	Swap bodies up to 41 ton	Lifting height, crane span
Number of LU/ day number of LU/ hour TEU/day	Length of transhipment track		Rail area, buildings and service area	Number of loading tonnes (maximum)	Number of quay cranes
Number trucks/ hour trucks/day	Number of transhipment lanes		Trailer parking area	Push boats, barges, vessels, locomotive	Number of reach stackers
Lifts/day moves/ hour	Number of semi-trailers		Number of TEU number of LU	Pop-up mechanism	Number of bridge cranes
Maximum capacity	Number of buffer lanes		Long-term or short-term	Max. weight of LU	
Terminal hard surface	Number of internal transport lanes			Max. length of LU, rc-barge	
Number of transhipments/day	Number of stacking lanes			Number of multi-trailer trains	
Number of moves/ trip	Quay length			Number of trucks	
	Dredging depth			Number of locomotive wagons	
	Number of loading tracks			Number of transit wagons	
	Total track length			Tractors, trailers army vehicles, cranes exceptional units	
	Length of crane track			Push tugs, Euro-pallets	

A *third* distinguishing factor is formed by the terminal operating time. For example, the opening hours per week, the opening hours per year, the opening hours per day, etc. Terminal size is a *fourth* distinguishing element among terminals. The terminal area can be mapped in hectares. Furthermore, another related interesting characteristic is a functional subdivision of the terminal area. The terminal area is then divided into a transhipment area, a storage area (short-term and long-term), rail area, parking area, road area, and the buildings and service area. A *fifth* characteristic area is formed by the LU and the transport means. Which LU and transport means can be handled? What is the maximum weight and length of LU and transport means? The *sixth* and final set of distinguishing features is formed by the number and type of cranes available at the terminal, of which gantry cranes, quay cranes, reach stackers, and bridge cranes may be offered.

2.3 Terminal Classes

Seen from the specific perspective of geographical coverage, volume, and capacity we may identify the following five characteristic types of freight terminals (see also Table II): the XXL-terminal, XL-terminal, L-terminal, M-terminal and S-terminal. These will now be discussed concisely.

(1) XXL or mainport terminal: will usually have abundant deep-sea, rail, truck, and barge connections throughout the world.

TABLE II Freight terminal types

	Volume	*Infrastructure*	*Terminal area*	*Cranes*
1. XXL-Terminal	> 500,000 ton/year containers/year moves/year TEU/year trains/year trucks/year transhipments/year	24–27 rail tracks 12–16 internal transport lanes road lanes quay length	400,000 m^2 200 × 2000 m 22–40 ha	4 gantry cranes
2. XL-Terminal	100,000–500,000	9–12 rail tracks 3 rail tracks 5 rail tracks	400,000 m^2 3 ha 8300 m^2 94,000 m^2 50 ha	14 cranes 2 cranes 4 cranes
3. L-Terminal	30,000–100,000		36,400 m^2	
4. M-Terminal	10,000–30,000	1–3 rail tracks 4 rail tracks	10,500 m^2	1 gantry crane
5. S-Terminal	< 10,000	1–2 rail tracks	9000 m^2	

Furthermore, this type of terminal can be characterised by low costs, high volumes, high capacity utilisation, IT-intensive operations and powerful global logistic players involved. Usually a main-port will either be a major seaport or a large airport with world-wide connections.

(2) XL or international European terminal: can be characterised by deep-sea, rail, truck, and barge connections on a more continental level. European-wide networks are served. This terminal is especially used as an international distribution centre.

(3) L or national terminal: is operated at the country level in Europe and has rail, barge, and truck connections at a country level. This terminal is used as a national distribution centre.

(4) M or regional terminal: is characterised by low costs through low budget solutions, relatively low volumes, relatively low IT-components in the operations, and smaller regional and national logistical players. This small terminal is used as a regional distribution centre. There are usually truck and rail or barge connections.

(5) S or local terminal: is only served locally by trucks that collect and distribute freight to and from their final destination. A simple connection with rail or barge is provided.

It should be absolutely clear that this sub-division of characteristics into five terminal groups does not cover all current European terminals unambiguously. Some terminals will have characteristics of two or more different terminal types. The aim of this classification is to distinguish among developments for different types of terminals. A classification of different types of terminals is very important for identifying promising terminals for the bundling of freight flows and/or the introduction of new generation terminals. General characteristics of current terminals are: terminals are land intensive; terminals are usually located within or nearby an urban area; there is a maximum number of users; there is a minimum number of road kilometres that is served; and the reach of a terminal is ideally limited to 50 km. Open access to a terminal is very important; every company willing to use the terminal services should be able to do so.

Alternative terminal types are based on the characteristics of freight flows (Bowersox *et al.*, 1986; de Wit and van Gent, 1989) that are handled by airport terminals combined with four types of bundling networks (TERMINET D1 and D2, 1997a–c): point-to-point, trunk

line with collection/distribution, line, hub-and-spoke. This combination leads to the following four freight terminal types:

(1) Bulk terminal
(2) Transfer terminal
(3) Distribution terminal
(4) Hinterland terminal.

Bulk terminal This is the mainport with large volumes and global freight connections. Bulk refers to large volumes and not to bulk freight. Large freight flows arrive at the terminal and are split into smaller flows for further transport. These smaller flows do however have enough volume to fill an entire barge, train or ship. These terminals are noted by grand storage areas, rapid loading and unloading, intensive use of IT, and intelligent terminal internal transport. The corresponding bundling model is point-to-point.

Transfer terminal This type of terminal is almost exclusively aimed at transhipping continental freight. There is almost no collection and distribution in the region where the terminal is located. The freight arrives at and departs from the terminal in huge flows. The terminal is characterised by large areas that enable direct transhipment between trains and/or barges. The corresponding bundling model is the hub-and-spoke network.

Distribution terminal A distribution terminal is a so-called "intelligent terminal". At this terminal value added is created in the form of an extra service provided by the terminal operator. From location A, B, and C continental freight arrives at the terminal and is consolidated into shipments for customers X, Y, and Z. One or more terminal services is added by the terminal operator to the shipments at the terminal. The corresponding bundling model is the line network.

Hinterland terminal Small continental cargo shipments are brought to the hinterland terminal and consolidated into bigger freight flows. These bigger freight flows are further transported via rail or inland waterway. The corresponding bundling model is the trunk line with a collection and distribution network. The relations of the freight flows can also run the other way around; big transport means bring freight flows to the hinterland terminal, where the flows are split into smaller shipments and distributed locally.

3 BUYERS OF TERMINAL SERVICES

We will now discuss the second competitive force from Porter's model. The strength of this competitive force depends on the number of buyers and the relative sales volume the buyer represents to the terminal operator. If a buyer of terminal services purchases, for example, 50% of the terminal movement capacity, then their position vis-à-vis the terminal operator will be relatively strong. If they choose another terminal, the operator is left with a capacity gap of 50% which takes time to be filled. The buyers will test the profitability of industry competitors by trying to lower prices, negotiating better quality and greater service, threatening to integrate the service into their own assortment, or by negotiating with more industry competitors simultaneously. The buyer of terminal services (shipper) is a person/company who arranges for goods to be shipped. The shipper can either be a carrier – company that carries goods for payment – or an intermediary. An intermediary can be a company that is responsible for loading and unloading ships (stevedore), a person who buys and sells transport capacity for others (ship broker), a representative who looks for door-to-door solutions that suit customers (shipping agent), or a person/company who sends goods to someone (forwarder).

The position of the buyer is especially strong if the seller (terminal operator) has high investment cost and if the importance of a good capacity utilisation is very high. This is the case in the terminal market. This strong position of the buyers of terminal services is obviously threatened by the terminal operators who lack information about the freight terminal market. A striking example of a similar sort of relation is the insurance market. The insurance companies provide information but it is almost impossible to compare their products. This means that industry competitors have the power rather than the consumers.

The terminal service is expensive and forms a relatively large share of the total combined transport cost. This means that the buyer will have to conduct research in order to find the best price. Unfortunately, there is almost no public information on terminal tariffs so the buyer will often switch to unimodal road transport. The central service provided at the terminal is the movement of goods. This service may be direct *transhipment*; this is a direct exchange of LU between the same transport

mode. Another movement oriented service may be *shunting*; this is the direct re-positioning of complete transport means including the LU. Usually this takes the form of the re-positioning of complete rail wagons. Finally, we have the *switching* service; this is the direct exchange of LU from one transport mode to another – different – transport mode. Other central terminal services are loading, unloading, storage, and cargo groupage. The terminal services are sold by the terminal operator to customers. The buyers of terminal services can be found among the road/rail/barge carriers and the intermediaries. For the buyer of the terminal services it is very important to receive maximum service quality for the best possible price. The buyer of the terminal service is involved in logistical chains and the terminal services are a very small but relatively costly segment of that chain. So one of the most important tasks for the terminal operator is to provide services that fit into the logistical chains of customers. In other words, it should be crystal clear that the terminal operator is the servant of the terminal service(s) buyers. The task is to provide the best service(s) at the right time, at the right place, for the best possible price!

A terminal operator is no monopolist because at least the terminal has to compete with unimodal road transport that completely bypasses the services of the freight terminal. In this context it is assumed that the use of terminal services is always in combination with combined transport of goods. Far too often unimodal road transport is a better alternative than the use of terminal services in combination with multimodal combined transport. It is very difficult for the buyer of terminal services to compare among terminals, because the published official tariffs are not used. This means that the comparison of unimodal road transport with combined transport – including the use of one or more freight terminals – is complicated, very time and cost consuming, and thus often not attempted.

The delivery of terminal services is very complicated for the terminal operator, because there are so many actors and therefore numerous wishes. Actors can be found among road, rail, barge and combined transport companies and the intermediaries. These buyers all have specific characteristics and desires. This indicates one important success condition of the terminal operator: to demonstrate maximum flexibility.

4 SUPPLIERS OF TERMINAL FACILITIES

Here we will pay attention to suppliers of terminal facilities. These suppliers can use their economic power, for example, by raising prices and lowering the quality of their goods and/or services. Another option for the supplier is to threaten integrating of terminal services into their own assortment. The strength of this force further depends on the number of suppliers; if the suppliers of terminal infrastructure are concentrated, in general they have greater economic power. If the threat of substitute products is low, this will also increase the power of suppliers. If the economic prospects of the supplier interferes with the prospects of the terminal operator, then their attitude will be more reasonable towards the operator. It is known that suppliers of terminal cranes usually do have other businesses; their future does not directly interfere with the buyers of their terminal facilities. The position of the suppliers of terminal facilities is further enhanced because the terminal operators have high switching costs.

The very large variety of actors complicates this competitive force. Terminal facilities are supplied to provide one or more of the following services: loading and unloading, direct transhipment, storage, cargo groupage, freight handling, collection and/or distribution of freight, renting, leasing or selling services, physical transport of freight, freight monitoring, manufacturing, and intelligent transport.

Suppliers of terminal facilities can be either the makers of the terminal facilities (cranes or warehouses), or the owners of cranes or warehouses who rent or lease the required capacity to terminal operators. The suppliers of terminal facilities should be very eager in what they deliver to whom. There are different types of terminals meaning that suppliers of terminal infrastructure will have to deliver different types of infrastructure. For example, a Hinterland terminal will use different equipment to a Transfer terminal. Furthermore, the terminal facilities need to be extremely flexible to satisfy customer demand whenever possible. Especially Hinterland terminals need to be flexible, by having low investments in equipment which can also easily be transferred to a new location if a change occurs in the flows of goods. A lack of adequate equipment (e.g. small cranes) will clearly prompt the technical compatibility and the terminal service ability to decline.

5 POTENTIAL ENTRANTS INTO THE FREIGHT TERMINAL MARKET

Potential entrants into the freight terminal market are newly constructed terminals. This fourth competitive force imposes a serious threat to current operators in the terminal market. New terminals will increase capacity as well as competition in the terminal market in a specific terminal service area and thus impact utilisation rates of existing terminals. This could result in lower prices and/or higher costs and also the transport network could be affected. Even if no extra terminal capacity is added, the take-over of a terminal operator to create a market position also means the entrance of a new industry competitor. This dynamic in transport networks and freight terminals indicates that the patterns of the flows of goods are subject to permanent change (Nijkamp *et al.*, 1994). The freight terminals must be flexible and adaptable to changing circumstances.

The barriers for potential entrants to the terminal market are not high. Nowadays many terminals are built and/or operated in a more or less uncoordinated way. The number of terminals may grow too fast, resulting in under-utilised terminals. Competition among terminals in the long-run may drive down prices which for well-located terminals may result in "overloaded" terminal capacity. In the short-term though, it means individual quality and performance of terminals worsens. The total transport network performance may even be influenced. The increase in terminal service capacity may even threaten current terminals in their daily operations. In response to this development, current freight terminals can install entry barriers. These barriers hinder (or ideally prevent) potential entrants to enter the terminal market. Barriers are important because the exit barriers in the terminal market are high; once a terminal is in use, it is relatively difficult to quit the operations because of the huge initial investments which are needed to start operations.

In general, major entry barriers are (Kotler, 1997):

- Customer loyalty. If the terminal operator has loyal customers, it will then be more difficult for a new terminal operator to attract new and existing clients. For the potential entrant this may result in heavy investments to change existing customer loyalty.
- Extension of terminal service assortment. A broader service assortment will, in principle, create a stronger company. At a freight

terminal for example, passenger transport can be added. A strong loyalty between the company and its customer groups can be created. Usually this requires significant investments in advertising and image building for the new service(s).

- Capital. If major investments are necessary to enter a market, this is also a major barrier. Not only are initial investments important, but so are losses in the start-up phase. High investments also result in considerable interest costs.
- Switching costs. If switching costs related to a change of supplier are high, this will impose a major barrier on switching. These switching costs are especially relevant for the terminal equipment.
- Economies of scale. The costs per service decrease as the size of the production increases. Economies of scale force the potential entrant to either enter the market on a small scale (resulting in high costs) or on a large scale (resulting in a sharp reaction by current competitors).
- Government barriers. The government can install entry barriers- for example, by requiring a certain quality level to be delivered by terminals.
- Location. The best terminal locations are usually already in use, so that entrants will have to take 'second best' locations to start their terminal operations.

Potential entrants to the freight terminal market are found among road/rail and barge transport companies eager to operate their own terminals. This is the first step in the introduction of real multimodal transport companies and/or multimodal ownership in the EU. Another threat comes from the big combined logistical players from the USA. These companies have much experience in operating multimodal networks and if the markets in the EU are opened, they will probably take the opportunities that are offered. These potential entrants are not to be seen as a threat but instead as a force to ensure better efficiency and improved utilisation of transport networks (Bithas *et al.*, 1997).

6 SUBSTITUTES FOR THE USE OF A FREIGHT TERMINAL

Substitutes decrease the potential profits of a sector by imposing a barrier on the prices industry competitors in a sector can request. Each

market will have to deal with options that replace current services or products that industry competitors produce. Substitutes for the use of a freight terminal are surprisingly one of the strongest competitive forces in the freight terminal market. The most important substitute in the terminal market is unimodal road transport. The position of unimodal road transport is extremely strong. This can either be caused by the very competitive solutions offered by unimodal road transport, by the weak combined transport solutions offered by the freight terminals, or by a combination of the two. Unimodal road transport is furthermore very competitive because of the flexibility of door-to-door transport and its rapidity. Road transport carriers have relatively small investments in terminal facilities and operate on publicly maintained highways. Freight terminals that form part of the combined transport solution have a different cost structure: relatively high fixed costs and relatively low variable costs.

The price/quality ratio provided by unimodal road transport usually exceeds the price/quality ratio provided by the terminal services forming part of a combined transport solution. The strength of unimodal road transport is a serious threat to the profitability of freight terminals. Cooperation between freight terminals could introduce a countervailing power to the strength of unimodal road transport. This cooperation could, for example, include monitoring quality performance levels (e.g. concerning safety, complaint handling, etc.) and collective promotion of the use of terminals and thus of combined transport. Another option for the freight terminal is to include unimodal road transport into its own service assortment. Further extension of the terminal service assortment may also include diverted terminal services like dining possibilities and the provision of accommodation. These services are not directly aimed at the (direct) transhipment, groupage or storage of freight, but can offer interesting challenges for the terminal operator. Another promising extension for the terminal service assortment can be passenger transport. This combination of freight and passengers can also be found in the air transport market. These extensions of terminal service(s) can improve the overall (perceived) quality of the central terminal services and of combined transport as a whole. For the terminal operator this extension of service assortment can improve his profit performance.

Another substitute for the use of a freight terminal is given by the possible introduction of entirely new transport modes. Research is

needed for completely new transport modes and it seems as though this will take the form of underground intelligent transport options. A good example from the Netherlands of a more or less completely new form of transport is the proposed underground transport of flowers from the Aalsmeer flower auction to Amsterdam Schiphol Airport (Geijn *et al.*, 1995). In this specific case, a new underground logistical system in the form of an economically feasible alternative to the currently used unimodal road transport service would be necessary. The expected growth of flower volumes, the increased congestion, and the rise in environmental pressures in the long-term may justify such a new underground transport system. This means that a new built underground transport system may completely bypass currently used freight terminals and road transport options. However, these new systems may also induce an increase in the total transported volumes and they represent a possible extension of the service assortment of current terminals.

7 TERMINAL ENVIRONMENT

One influential force in the terminal market that is not incorporated in Porter's model of competitive forces is the terminal environment. Because of its complicated structure this force is only briefly discussed. The terminal environment includes all actors and factors that influence the terminal market and terminal operators in their daily operations, and do not belong to any of the five competitive forces in Porter's model. The terminal environment is defined here from a broad point of view. Incorporated in this additional competitive force are transport infrastructure, load units, transport means, transport networks, environment, and regulation.

Transport infrastructure The suppliers of transport infrastructure in Europe are usually found among national governments. They build and maintain rail, road and barge connections. The freight terminals need good transport connections in addition to their own area and terminal services offered. It is also imaginable that the whole corresponding physical transport service needed by the terminal operator is provided by a specialised carrier. Infrastructure is very important for

the freight terminal, because this is the connection with the world outside the terminal. The production, maintenance and usage of infrastructure are becoming more and more a government responsibility. Infrastructure policy is becoming more directive instead of following infrastructure demand. Attention is paid especially to optimal infrastructure capacity utilisation, sustainable mobility, and the improvement of network connections at the European level. Major problems in this field are congestion and the prevalence of national interest above European interests. There is a lack of international integration which leads to long decision-making processes resulting in "second-best" solutions. Generally, road connections are fairly good; it is mainly the international and metropolitan connections that could be improved. Barge connections are generally in reasonable shape, only the barge terminals require significant improvements. The largest problems are on the rail connections; there is insufficient rail capacity and no free access. The latest proposal is to liberalise rail freight transport. The first step should be for the EU-member states to give free access to 5% of their market. After a period of ten years this should have been increased to 25% of the market.

Transport means, load units, and transport networks Suppliers of transport means can either be the producers of transport means or the company that provides the terminal operator with the corresponding service. For example, a terminal operator can buy trucks to establish their own collection and distribution network, but it is also possible to buy that service from a third party. The terminal operator has to show maximum flexibility so as to handle transport means at their terminal as much as possible. In Europe many types of transport means are available. Unfortunately, national interests impose a major barrier on standardisation. An important development to be realised is scale enlargement. The only transport mode allowed to profit from this opportunity are barges. Huge new barges capable of transporting enormous quantities of TEU are being built to realise the cost benefits. The terminal environment is also formed by the load units. The producers of load units do provide a lot of different types and the current terminal market is characterised by numerous actors who use different types of LU which further complicates daily transport operations. In Europe increased attention is being given to transport networks. A network-oriented approach of transporting goods from

point A to point B may form part of better-utilised freight terminals and transport networks. This development is initiated by the owners of goods who are increasingly interested in complete – production embedded – logistic solutions. Fewer transport companies are used by the owners of the goods in order to work cooperatively on complete logistic and transport network solutions. These solutions should optimise the logistic performance of the involved companies.

Environmental issues In Europe important regulatory areas are in the promotion of combined transport and the corresponding issue of environmental safeguards. Combined transport is partly promoted because it is perceived as a relatively better transport option for the environment than is unimodal road transport. Currently external effects are not fully incorporated in transport cost and transport prices, and the goal is to better internalise these external effects. Road transport in the EU is very important, but it is also (very) environmentally unfriendly. External effects which are better incorporated into prices will relatively decrease the competitiveness of unimodal road transport. Barge, rail, and short-sea transport are perceived as more environmentally friendly than road transport. Other important issues at the environmental level are a more efficient capacity utilisation of the current transport mode capacity and the trend towards sustainable mobility.

Regulation European markets are over-regulated and especially national policy restrictions have negative impacts on European transport network integration. These regulations restrict competition which leads to transport costs that are relatively high and consequently hampers the generation of product innovation. New strategies are required that combine physical and financial options with opportunities offered by modern technology. Location policies and an increased use of information technology can especially reduce the demand for (unimodal road) transport so that the use of the transport network is improved and the demand for cleaner combined transport increases. Another improvement may follow from the introduction of neutral information clearing houses. But until recently, the terminal operators have not been interested in the provision of information, because they suspect that asymmetric information will result. Overall, it is evident that a free integrated European transport market is needed.

Aspects of this free market are de-regulation, free access on national markets, privatisation of state owned transport companies, and market opening at the European level. Especially transnational mergers may be encouraged to produce global transport integrators at the European network level. The implementation of a more market-oriented system implies more competition and may result in better efficiency of transport networks. Regulation should attempt to internalise conditions for successful combined transport- such as long railway/barge tracks, big storage areas, better services, integration of all container types, and EDI integration. New pricing techniques could also stimulate combined transport. In the case of Switzerland for example, the overwhelming role of rail freight, and especially combined transport, is produced by the regulation of road transport (28 ton limit) and subsidies for piggyback transport (Banister *et al.*, 1998).

8 RETROSPECT AND PROSPECT

In the terminal market exit barriers are relatively high and entry barriers relatively low. This implicates that profits in the freight terminal market are low and risky. A further complication arises because all terminal operators try to fill their capacity. This indicates further pressure on the profits in the market. Many industry competitors, potential entrants, suppliers of terminal infrastructure, buyers of terminal services, substitutes for the use of a freight terminal, and terminal environmental actors are involved in the market. This results in an inefficient use of the European transport network. Scale enlargement and more efficient transport operators who provide the producers of goods with complete logistical solutions are needed. The number of actors may decrease dramatically in the coming years. The current importance of the actual competitive forces of the groups of actors in the terminal market was visually depicted in Fig. 2. Figure 2 shows our syntheses that the competitive strength of the industry competitors is relatively weak, and therefore there is considerable room for improvement. The terminal environment force is taken as a given and excluded from this figure because additional research is needed. The suppliers of terminal infrastructure and the buyers of the terminal services have especially strong economic power. The strength of their economic power obviously

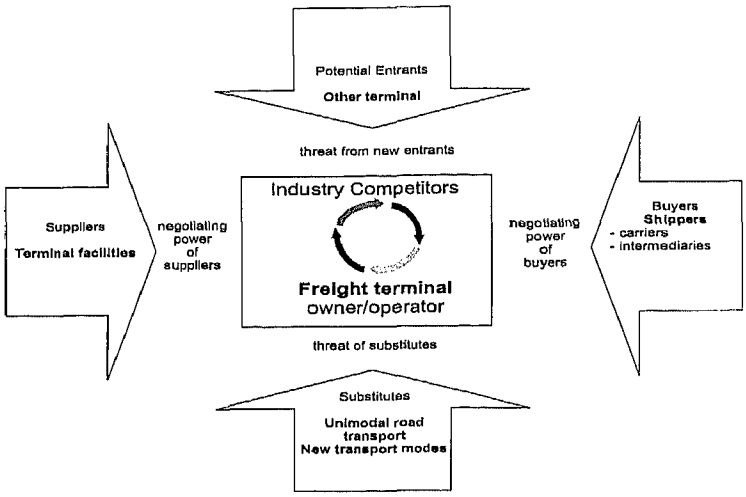

FIGURE 2 Porter's model of five competitve forces applied to the weights of the competitive forces in the intermodal freight terminal market.

restricts the profitability of industry competitors. The threat of potential entrants and the threat of substitutes further decreases the economic power of industry competitors.

Further research in this field may be concentrated on the strengthening of the economic power of the terminal operators and on the relation between the terminal operator and the terminal customers. This, for example, could be done by identifying promising directions to strengthen the competitive force of industry competitors. The introduction of new generation terminals may result in better performance and cost reductions. These terminals can be characterised by extensive use of information technology and fast (un)loading and transhipment systems. Promoting terminal services with professional and clear information may encourage (potential) customers to use more terminal services. Other solutions may come from a decrease in terminal costs, investing in the education of terminal employees, lowering exit barriers and installing higher entry barriers, and an increase in the use of information technology for cargo tracking and tracing.

Besides the improvement of the service assortment of the terminal operator, another promising development for terminal operators may

be found in the *relative decrease of economic power of buyers of terminal services*: (i) providing better information may encourage the use of terminal services (the information should enable the comparison of combined transport including the use of freight terminals with the use of unimodal road transport); (ii) delivering better terminal services (a better terminal performance and a well pre-defined quality level should result in adequately priced services delivered by a so-called terminal integrator); and (iii) initiating strategic marketing research focusing on customer needs.

The *economic power of suppliers of terminal facilities* can be lowered by the terminal operators by: (i) increasing the threat of substitute products (e.g. the terminal operator may also offer unimodal road transport and/or stimulate and facilitate the development of completely new transport modes); and (ii) co-operation among terminal operators (in this way the terminal operators can form a countervailing force towards the suppliers).

The *threat of potential entrants to the freight terminal market* may be lowered by improving the capacity management by the current terminal operators. Terminal operators should encourage customers to consume more and/or additional terminal services. Creating greater customer loyalty towards existing terminal operators – leading to long-term contracts – may make it difficult for new entrants to attract customers from other terminals. Other solutions may be found in the extension of the central terminal service assortment to other terminal related services and in the creation of economies of scale by cooperation among terminals and/or transport companies. This may enable the realisation of cost advantages.

The *substitutes for the use of a freight terminal* can also be used to improve the competitive strength of the current terminal operators, for example, by including unimodal road transport in the terminal service assortment or by playing an active role in the research and introduction of completely new transport modes.

Via the different competitive forces in Porter's model we have showed the strength of the different competitive forces in the freight terminal market. This led us to consider the prospects for terminal operators in the near future. Our research will continue with the measurement of the terminal service performance that may serve as a starting point for improving the terminal service assortment.

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